

**SENATE ENVIRONMENTAL QUALITY COMMITTEE  
SENATE BUDGET SUBCOMMITTEE 2  
INFORMATIONAL HEARING**

**Oversight on Green Chemistry:  
Implementation of AB 1879 (Feuer, 2008) and SB 509 (Simitian, 2008)**

**March 18, 2010  
Upon Adjournment of Session  
California State Capitol, Room 2040**

**Green Chemistry**

The premise of green chemistry is to design chemicals, materials and processes that protect human health and the environment by replacing hazardous chemicals, processes and products with safer alternatives. There are twelve accepted principles of green chemistry that can be applied to the four main phases of every chemical and product lifecycle: design, manufacture, use and end-of-life. By providing a closed-loop (or lifecycle) system for the design, manufacture, use and management of chemical substances and wastes, green chemistry can prevent human and environmental exposure.

**The Importance of Green Chemistry**

There are currently more than 80,000 chemicals approved under federal law for use in the United States. Each day, a total of 42 billion pounds of chemical substances are produced or imported in the U.S. for commercial

and industrial uses. An additional 1,000 new chemicals are introduced into commerce each year. Approximately one new chemical comes to market every 2.6 seconds. Global chemical production is projected to double every 25 years.

The average U.S. consumer comes into contact with 100 chemicals per day. Given the magnitude of chemical production, use and exposure in the United States, it is crucial to ensure that appropriate testing and safety policies for the design, manufacturer, use and disposal of chemicals and products are in place as safeguards for the protection of human health and the environment.

### **Chemicals and Human Health Impacts**

In 2009, the U.S. Centers for Disease Control conducted the *Fourth National Report on Human Exposure to Environmental Chemicals* which measured 212 chemicals in the blood and urine of a representative population of California. This study and other “body burden” studies quantify known chemicals in human tissues. Many of these chemicals identified in body burden studies have been correlated with decreased male and female fertility, obesity, cancer and chronic diseases and, in animal models, have been shown to have causative effects.

Chemicals play a role in chronic disease. Among children, chemical exposures contribute to 100% of lead poisoning cases, 10-35% of asthmas cases, 2-10% of some cancers and 5-20% of neurobehavioral disorders. And the rate of disease is increasing. Even without clear causative effects, there are clear correlations of increasing disease that may have environmental origins:

- Leukemia, brain cancer, and other childhood cancers have increased by more than 20% since 1975 (Woodruff, 2008, USEPA).
- Breast cancer increased by 40% between 1973 and 1998 (Howe, 2001, JNCI)
- Asthma approximately doubled in prevalence between 1980 and 1995 and has stayed at the elevated rate (Woodruff, 2004, *Pediatrics*; Moorman, 2009, CDC).
- Difficulty in conceiving and maintaining a pregnancy affected 40% more women in 2002 than in 1982. The incidence of reported difficulty has almost doubled in younger women, ages 18–25

- (Chandra and Stephen, 1998, *Family Planning Perspectives*; Chandra, 2005, *Vital and Health Statistics*; Brett, 2008, NCHS)
- The birth defect resulting in undescended testes has increased 200% between 1970 and 1993 (Paulozzi, 1999, EHP).
  - Autism diagnoses have increased more than 10 times in the last 15 years (NIMH, 2009).

**Susceptibility.** While studies have established correlative relationships between health effects and body burden, the causality relationship is still unknown. There is still a lack of data concerning how having detectable levels of 212 chemicals impacts an individual's health now and what the health impact of today's exposure is in 30 years. Additionally, what are the potential different impacts on vulnerable populations: pregnant women, infants and children as well as both males and females during prime reproductive years?

**Synergy.** In addition to susceptibility questions, current scientific tests have not been able to fully determine what the synergistic effects of these chemicals are in the body, i.e., whether they are acting together and amplifying the effects of each other. New studies have provided some preliminary evidence, though, that many chemicals act and disrupt normal hormonal signaling (i.e., endocrine-disrupting), which have been shown to have additive or even multiplicative health effects.

**Bioaccumulation and Heredity.** Another aspect of the chemicals detected in body burden studies is that they are bioaccumulative, which means they persist in the body, often in fatty tissues, and are not quickly metabolized and excreted from the body, which means that they will add up over a lifetime. For example, although chemicals such as PCBs and DDT have been banned for years, they continue to be found in children today. More recently it has been shown that some chemicals, such as the much-discussed Bisphenol A (BPA), can have epigenetic effects, which means the chemicals and their health effects can be passed on from generation. For example, in a 2010 study in *Life Sciences*, with rats exposed to BPA, the male grandchildren, while not ever directly exposed, were still found to have reproductive defects. These new findings echo the well-known effects of other estrogen-like compounds such as diethylstilbestrol (DES), which has well-documented transgenerational reproductive effects in humans.

## **The Toxic Substances Control Act (TSCA)**

The federal Toxic Substances Control Act of 1976 (TSCA) authorizes USEPA to require reporting, record-keeping and testing requirements, and set restrictions relating to chemical substances and/or mixtures. Certain substances are generally excluded from TSCA, including, among others, food, drugs, cosmetics and pesticides. TSCA addresses the production, importation, use, and disposal of specific chemicals. Among its provisions, TSCA requires USEPA to maintain the TSCA inventory which currently contains more than 83,000 chemicals. As new chemicals are commercially manufactured or imported, they are placed on the list.

TSCA requires the submission of health and safety studies which are known or available to those who manufacture, process, or distribute in commerce specified chemicals; and allows USEPA to gather information from manufacturers and processors about production/import volumes, chemical uses and methods of disposal, and the extent to which people and the environment are exposed.

**Data Gaps in TSCA** – Within TSCA there are several areas where there are vast gaps in data available about chemicals currently in use in the United States. For example:

- TSCA places the responsibility for conducting health and environmental impact testing on USEPA, not the producer of the chemical substance or mixture. To date, USEPA has conducted testing and published data on 200 chemicals on the inventory of 83,000 chemicals.
- TSCA does not provide for the review of synergistic health and environmental impacts of the potential interactions of the thousands of chemicals and the potential multitude of exposures and exposure pathways.
- There were 62,000 chemicals in use in 1976 when TSCA was adopted into federal law. TSCA provides for a grandfather clause for those 62,000 chemicals.
- TSCA provides chemical producers protections for confidential business information (CBI), allowing producers to not publicly disclose information about new chemicals entering commerce.

To date, the USEPA has reported that nearly two-thirds of the new chemicals reported under TSCA over the last 33 years have claimed CBI protection.

**Current Actions under TSCA** – On September 29, 2009, USEPA Administrator Lisa Jackson announced enhancements to the agency's current chemicals management program under TSCA in an effort to identify chemicals that pose a concern to the public, move quickly to evaluate them and determine what actions need to be taken to address the risks they may pose, and initiate appropriate action. EPA will produce "chemical action plans," which will target the agency's regulatory efforts on chemicals of concern.

On December 30, 2009, EPA posted action plans on phthalates, perfluorinated chemicals, polybrominated diphenyl ethers and short-chain chlorinated paraffins. These action plans summarize available hazard, exposure, and use information; outline some of the risks that each chemical may present; and identify specific steps that USEPA is taking to address those concerns.

However, even with the enhanced efforts, in 2009 the Government Accountability Office found USEPA's implementation of TSCA to be "high-risk" because "EPA has failed to develop sufficient chemical assessment information on the toxicity of many chemicals that may be found in the environment as well as tens of thousands of chemicals used commercially in the United States" and concluded by stating that Congress may wish to amend TSCA and extend the EPA more explicit authority. At a recent Congressional hearing in February 2010, the GAO director again reiterated concerns, brought up new insufficiencies in USEPA's use of the authority and direction of TSCA, and called for legislative reform of TSCA. USEPA's own Inspector General additionally declared on February 17, 2010, a need to make internal reforms to more strictly enforce TSCA and set timelines for how long confidential business information can be kept secret rather than allowing for indefinite disclosure protections.

### **Green Chemistry in California**

For more than a decade, California has struggled to fill in the gaps in TSCA chemical policy. The Legislature has considered over a hundred

bills proposing chemical bans and broader chemical policies for California, heard testimony from “battling scientists” and was interested in developing a broader, more comprehensive approach to chemicals policy. (For a review of California legislation in the last decade, see the attached table.)

In 2003, the Senate Environmental Quality Committee and the Assembly Committee on Environmental Safety and Toxic Materials commissioned a report from the University of California to investigate the current legal and regulatory structure for chemical substance and report on how a California chemicals policy could address environmental and health concerns about chemical toxicity, build a long-term capacity to improve the design and use of chemicals, and understand the implications of European policy on the California chemical market.

In 2006, the U.C. Berkeley authors presented the commissioned report, *Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation* and made a connection between weaknesses in federal policy, namely TSCA, and the health and environmental damage happening in California. The report broadly summarized their findings into what they called the “three gaps”.

### **The Three Gaps**

- **Data Gap:** There is a lack of information on which chemicals are safe, which are toxic, and what chemicals are in products. The lack of access to chemical data creates an unequal marketplace. California businesses cannot choose and make safer products and respond to consumer demand without ingredient disclosure and safety testing.
- **Safety Gap:** Government agencies do not have the legal tools or information to prioritize chemical hazards. Under TSCA only 5 chemicals out of 83,000 have been banned since 1976. The California legislature has frequently addressed this problem by approving individual chemical bans. Chemical bans come before the legislature because there are very few other mechanisms in place at the federal or state level that can remove harmful chemicals from the marketplace.
- **Technology Gap:** There is an absence of regulatory incentives, market motivation which stems from the data gap, and educational

emphasis on green chemistry methodologies and technologies. In order to build a substantial green chemistry infrastructure a coincident investment and commitment must be made to strengthen industrial and academic research and development.

In order to fill the three gaps in chemicals policy, several policy recommendations were made in the 2006 report and expanded in a follow-up 2008 Cornerstone report. To fill the data gap, sufficient information for businesses, consumers and public agencies must be generated to choose viable chemical alternatives. To close the safety gap, known hazards must be addressed, chemical substances need to be prioritized and producer responsibility should be improved. To seal the technology gap, green chemistry education and research should be supported and technical assistance and incentives should be developed. The thesis of these reports explained that a more effective, comprehensive toxics policy approach would streamline California markets' ability to react to new scientific information and proactively protect California's health and environment.

In 2007, the California Environmental Protection Agency launched California's Green Chemistry Initiative within the Department of Toxic and Substances Control (DTSC). The California Green Chemistry Initiative Final Report released in December 2008 included the following six policy recommendations for implementing this comprehensive program in order to foster a new era in the design of a new consumer products economy – inventing, manufacturing and using toxic-free, sustainable products.

1. **Expand Pollution Prevention** and product stewardship programs to more business sectors to focus on prevention rather than simple source reduction or waste controls.
2. **Develop Green Chemistry** Workforce Education and Training, Research and Development and Technology Transfer through new and existing educational program and public/private partnerships.
3. **Create an Online Product Ingredient Network** to disclose chemical ingredients for products sold in California, while protecting trade secrets.

4. **Create an Online Toxics Clearinghouse**, an online database providing data on chemical, toxicity and hazard traits to the market place and public.
5. **Accelerate the Quest for Safer Products**, creating a systematic, science-based process to evaluate chemicals of concern and identify safer alternatives to ensure product safety.
6. **Move Toward a Cradle-to-Cradle Economy** to leverage market forces to produce products that are “benign-by-design” in part by establishing a California Green Products Registry to develop green metrics and tools for a range of consumer products and encourage their use by businesses.

### **International Green Chemistry Efforts**

#### **European Union – REACH**

In 2006 the European Union adopted the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH). REACH requires producers and importers to perform basic toxicity testing on their products and to disclose the identities of chemicals in their products. In addition, REACH prioritized chemicals based on their production volume or the risk-level they pose to humans. These prioritizations have created a warning list of 1100 chemicals that cannot be used in human-contact products and banned the first seven chemicals under this directive in June 2009, musk xylene, 4,4'-diaminodiphenylmethane (MDA), short chained chlorinated paraffins (SCCPs), hexabromocyclododecane (HBCDD), and three phthalates, bis(2-ethylhexyl)phthalate (DEHP), benzylbutylphthalate (BBP), and dibutylphthalate (DBP).

#### **European Union – RoHS.**

The Restriction of Hazardous Substances was adopted by the European Union in 2003 and took effect in 2006. RoHS restricts the use of six chemicals, Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), and Polybrominated diphenyl ether (PBDE) in electronics and electrical equipment and sets their maximum permitted concentrations to 0.1% or 1000 ppm (cadmium is limited to 0.01%). This regulation has implications for the manufacture and design



of many electronic components which relied heavily on the use of heavy metals as well as many commonplace household items that are imported into or sold into the European Union.

### **Canadian Chemicals of Concern**

The Canadian Environmental Protection Act of 1999 governs many aspects of chemical assessment and regulation in Canada, including government screening and categorization of chemicals. The Domestic Substances List, an inventory of approximately 23,000 chemicals, was completed in 2006. The Chemicals Management Plan aims to gather additional information on about 200 high-priority chemicals, with industry required to provide information on their use, manufacturing, and importation. Screening is expected to be completed 2007–10, with risk management assessments completed 2010–13.

### **International Cooperation on POPs**

The Stockholm Convention, also known as the “POPs Treaty,” is a global treaty aimed at protecting human health from persistent organic pollutants, or POPs: toxic compounds that persist in the environment and accumulate in human and animal fat cells. The Convention calls for ratifying governments to take steps to reduce or eliminate the release of 12 specific POPs, and provides technical and financial support for developing countries for its implementation as well as mechanisms for addition of new POPs. The 12 priority POPs are: aldrin, chlordane, DDT, Dieldrin, dioxins, endrin, furans, heptachlor, hexachlorobenzene, mirex, toxaphene, and PCBs. In 2009 parties to the Stockholm Convention agreed to add nine more POPs to its list of 12 substances targeted for elimination. This is the first time new chemicals were added to the list of POPs since the Convention took effect in 2004. More than 50 governments have ratified the convention, including the European Union. The US has signed, but not ratified, the treaty.

### Chemical legislation in California the last decade:

Bill	Date	Chemical	Comment	Status
AB 2237 Chu	2002	Cadmium, Hexavalent Chromium, Lead, Mercury	Reduce use in packaging materials	Failed
AB 302 Chan	2003	PBDEs	Phase out penta- and octa-PBDEs by 2008	Chaptered
AB 455 Chu	2003	Cadmium, Hexavalent Chromium, Lead, Mercury	Toxics in Packaging Prevention Act	Chaptered
AB 689 Ortiz	2004	Chemical substances	Biomonitoring Program	Failed
AB 854 Koretz	2004	Perchloroethylene	Complete ban by 2014	Amended*
AB 1006 Chu	2004	Toxic pesticides	Prohibited for use in schools	Failed
AB 1139 Lowenthal	2004	DEHP (phthalate)	Prohibited use in medical device or require labelling	Failed
SB 1168 Ortiz	2004	Chemical substances	Biomonitoring Program	Failed
AB 1940 Chan	2004	High production volume chemicals	Regulate and monitor HPV chemicals	Failed
AB 2587	2004	PBDEs	Amends AB 302 (2003) and defines terms in the PBDE ban/phase-out	Chaptered
AB 263 Chan	2005	PBDEs	Amends prohibition to include fines	Amended*
AB 319 Chan	2005	BPA, Pthalates	Children's products	Failed
SB 484 Migden	2005	Toxic substances	Safe Cosmetics Act	Chaptered
SB 490 Lowenthal	2005	Hazardous chemicals	Cooperate with Netherlands to compile hazards list	Amended*
AB 815 Lieber	2005	Toxic substances	Permissible exposure limits for hazardous substances	Failed
AB 816 Lieber	2005	Chemical substances	Require chemical distributors to report purchasers of chemicals that can harm employees	Vetoed
SB 600 Ortiz	2005	Chemical substances	Biomonitoring Program	Vetoed
AB 908 Chu	2005	Pthalates	Full prohibition in cosmetics; ingredient listings on internet	Failed
AB 990 Chan	2005	Halogenated solvents	Full prohibition requiring substitutes	Failed
AB 289 Chan	2006	Chemical substances	Testing information	Chaptered

			from manufacturer	
SB 849 Escutia	2006	Chemical substances	Establish CA Environmental Health Tracking Program	Vetoed
SB 960 Simitian	2006	Hazardous waste	Replace DTSC database with links to Massachusetts Toxic Use Reduction Institute	Vetoed
SB 1379 Perata	2006	Chemical substances	Biomonitoring Program	Chaptered
AB 1681 Pavley	2006	Lead	Children's jewelry	Chaptered
AB 2490 Ruskin	2006	Toxic substances	Establish CA Toxic Release Inventory Program	Vetoed
AB 258 Krekorian	2007	Plastics	Control plastic pellet discharges to marine environments	Chaptered
SB 456 Simitian	2007	Diacetyl	Full prohibition	Failed
AB 513 Lieber	2007	PBDEs	Adds deca-BDE ban in electronic products	Failed
AB 515 Lieber	2007	Hazardous chemicals	Permissible exposure limits for hazardous substances	Failed
AB 558 Feuer	2007	Hazardous materials	Reduce use and develop source reduction plan; recommendations for Green Chemistry Initiative	Failed
SB 578 Simitian	2007	High production volume (HPV)	Health info for HPVs already reported to foreign government	Amended*
SB 774 Ridley-Thomas	2007	Lead	Restricts glass bottle lead levels	Chaptered
SB 899 Simitian	2007	Packaging materials	Prohibit packaging with styrene, bisphenol-A, perfluorooctanoic acid, vinyl chloride, nonylphenol, oralkylphenol	Failed
AB 954 Brownley	2007	PVC, Pthalates	Packaging containers	Failed
SB 973 Simitian	2007	Chemicals of concern	Adopt from Canadian list	Amended*
AB 1108 Ma	2007	Pthalates	Children's products	Chaptered
AB 1604 Caballero	2007	Pesticides	Replace with less polluting and toxic fumigants	Amended*
SB 291 Simitian	2008	Chemical substances	Design for the	Failed

			Environment	
SB 509 Simitian	2008	Chemical substances	Toxic Information Clearinghouse	Chaptered
AB 514 Lieber	2008	Diacetyl	Employment prohibition	Failed
AB 558 Feuer	2008	Chemical substances	Test and evaluate hazard traits	Failed
AB 706 Leno	2008	Flame retardants	Extend labeling and use restrictions	Failed
AB 820 Karnette	2008	Polystyrene	Banned food containers	Failed
SB 1230 Maldonado	2008	Phosphorous	0.5% limit in cleaning products	Failed
SB 1313 Corbett	2008	PFOA	Food packaging	Vetoed
SB 1712 Migden	2008	Lead	Cosmetics (lipstick)	Failed
SB 1713 Migden	2008	Phthalates, BPA, lead	Children's products	Failed
AB 1879 Feuer	2008	Chemical substances	Green Chemistry	Chaptered
AB 2694 Ma	2008	Lead	Children's products	Failed
AB 2808 Garcia	2008	Cleaning products	Use environmentally sensitive cleaners and alternatives in schools	Failed
AB 2901 Brownley	2008	Lead	Children's jewelry	Chaptered
AB 3025 Lieber	2008	Polystyrene	Use of recycled material in packaging	Chaptered
SB 757 Pavley	2009	Lead	Wheel weights	Chaptered
AB 1078 Feuer	2009	Consumer products	Define consumer product; trade secret	Failed
AB 1131 Feuer	2009	Toxic substances	Life cycle toxic reduction	Failed
SB 22 Simitian	2010	Chemical substances	OEHHA hazard trait prioritization	Pending
SB 346 Kehoe	2010	Heavy metals; asbestos	Brakes	Pending
SB 443 Pavley	2010	Cleaning products	Risk assessment in supermarkets	Pending
SB 772 Leno	2010	Fire retardants	Exempts infant materials from fire retardant requirements	Pending
SB 797 Pavley	2010	BPA	Children's containers	Pending
AB 821 Brownley	2010	Cleaning products	Use environmentally preferable cleaners in schools	Pending
SB 928 Simitian	2010	Consumer products	Ingredient disclosure	Pending

\*Subsequently amended to a new subject